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FCC MAIL BRANCH

March 2, 1989

Ms. Donna Searcy
Secretary
Federal Communications Commission
1919 M Street, N.W.
Room 222
Washington, D.C. 20554

Re: MM Docket No. 87-268

Dear Ms. Searcy:

Enclosed are three copies of comments filed on behalf of NBC in an NTIA Inquiry on Production Standards for High Definition Television, Docket No. 81257-8257. Because the issues addressed in our pleading are related to issues under consideration in the Commission's proceeding in the above-referenced docket, NBC would like to submit a copy of these comments for inclusion in the record in MM Docket No. 87-268.

Thank you very much.

Sincerely,

Molly Pauker

cc: David Siddall, Esq.
Acting Assistant Chief for Law
Douglas Webbink, Esq.
Acting Assistant Chief,
Policy & Rules Division

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Before the
UNITED STATES DEPARTMENT OF COMMERCE
NATIONAL TELECOMMUNICATIONS AND INFORMATION ADMINISTRATION
Washington, D.C. 20230

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In the Matter of)	
)	Docket No.
Notice of Inquiry)	81256-8257
Production Standards for High)	
Definition Television (HDTV))	

COMMENTS
OF
NATIONAL BROADCASTING COMPANY, INC.

INTRODUCTION

National Broadcasting Company, Inc. (NBC) is a corporation that owns and operates seven VHF television stations and a commercial television network with 203 affiliated stations nationwide. NBC's Cable Division has in active development a consumer and business news program service for cable systems, to be launched on April 17, 1989, and has other cable program projects underway.

NBC engineers pioneered black-and-white, color and stereophonic sound television in this country. NBC has been actively involved in the development of an advanced television system for this country for nearly a decade. On October 1, 1987, NBC announced that, with the David Sarnoff Research Center (Sarnoff), formerly RCA Laboratories, and Thomson Consumer Electronics, Inc.

(Thomson), formerly RCA/GE Consumer Electronics, it had developed Advanced Compatible Television (ACTV). This is a single-channel, NTSC-compatible advanced television system that can provide widescreen pictures, increased vertical and horizontal resolution and far more clarity than present TV pictures, while maintaining compatibility with the existing channel allocations and NTSC home receivers. ACTV is also expandable into a system that can provide even greater resolution, at such time as additional spectrum is made available for U.S. broadcasters. It is our view that a system such as ACTV is ideal for the American television industry because it will allow for a gradual, evolutionary transition into advanced television within today's channel capacity without making existing NTSC receivers obsolete. First publicly announced in 1987, ACTV has been in active development for several years. On February 27, 1989, authority was obtained from the FCC to conduct terrestrial broadcast field tests of ACTV-I, the single-channel ACTV system. These tests are expected to commence this month.

NBC also has been an active participant in the FCC's inquiry on advanced television systems (ATV) and has been involved in all aspects of the work of the FCC's Advisory Committee on Advanced Television Service. We have testified several times before the House Subcommittee on

Telecommunications and Finance and, on February 1, 1989, with Sarnoff and Thomson, submitted a report on ATV development in the United States to that Subcommittee.

NBC has been involved in ATV research and development in many forums. NBC is a founding member of the Center for Advanced Television Studies (CATS) and holds a seat on the Board of Directors and is active participant on the Executive Committee and the Technology Groups of the Advanced Television Systems Committee (ATSC). NBC is a founding member of the Advanced Television Test Center (ATTC) and a participant in the Exchange Carriers Standards Association, which recently has undertaken a study program in the transport of ATV signals. NBC is a founding member and active participant on the Technical Committee of the North American National Broadcasters Association (NANBA). NBC is an active participant in the advanced television activities of the Society of Motion Picture and Television Engineers (SMPTE) and an NBC expert is the present Vice President for Engineering of SMPTE.

NBC experts also have participated in an advisory capacity to various CCIR Study Groups, as well as participating directly on the U.S. Delegations to various Study Groups (including Study Group 11, "Broadcasting

Services [Television]))" with the designation "special government employee" by the United States Department of State, and NBC engineering specialists have been designated U.S. representatives to various Interim Working Parties. Recently, NBC has been accepted as a participant in the work of the CCIR as a "recognized private operating agency."

NBC believes that the foregoing experience well qualifies it to comment on the questions raised in the present Notice of Inquiry (Notice).

Initially, we wish to state that NBC is heartened that NTIA has initiated this inquiry, providing a much-needed forum for the discussion of an important aspect of advanced television. Although production standards are unregulated in this country, this issue has significance for ATV transmission and equipment, and, as the Notice recognizes, HDTV production standards are currently the subject of intense international scrutiny. Not only will the HDTV production standard adopted domestically have profound consequences for the ease with which United States broadcasters can transmit HDTV and ATV signals to the American public but it also may affect the United States' ability to export programming, as well as other issues of international trade significance to this nation.

Background

Work on an HDTV standard began in the CCIR in 1974, when CCIR Study Group 11 resolved as follows:

The CCIR unanimously decides that the following should be studied: what standards should be recommended for high-definition television systems intended for broadcasting to the general public?

In 1983, Interim Working Party (IWP) 11/6 was established and instructed to:

... prepare, within the present study period, a draft Recommendation for a single world-wide high definition television standard for the studio and for international programme exchange, to be submitted to Study Group 11.

In 1985, IWP 11/6 submitted to Study Group 11 Report 801-2, Annex II, a draft Recommendation concerning parameters for HDTV production, "Parameter Values for Signal Generation in HDTV Studios and for International Exchange of HDTV Programmes," with parameters for broadcast standards to be considered subsequently.

As the Notice states, the 1986 CCIR Plenary Assembly did not reach an agreement and decided to submit the matter for further study prior to the 1990 Plenary. At

the January, 1989, meeting of IWP 11/6, additional proposals were submitted for consideration at Study Group 11's May, 1989 extraordinary meeting on HDTV. At present, it appears that no consensus will be reached on a single, worldwide HDTV standard during the 1986-1990 CCIR study period.

Discussion

NBC's views on the HDTV production standard issue have been based on the following reasoning. Because different nations are starting with different national systems based upon considerations including national electrical systems with different field rates, it is inevitable that different ATV transmission systems will be adopted in different countries. No one has suggested a universal ATV transmission system. Therefore any single universal HDTV production standard will require transcoding at the various national levels. Transcoding is inconvenient, expensive and can introduce artifacts into the system. Therefore, the necessity for transcoding should be kept to a minimum and, moreover, logically the cost of transcoding should be borne by the sector that would benefit from it. A single, worldwide HDTV standard would benefit those involved in international program exchange, not the over 1,400 individual U.S. broadcasters.

U.S. adherence to the 1125/60 production standard would effectively impose this cost on every U.S. local broadcaster and cablecaster, rather than on those engaged in interantional program exchange.

Nevertheless, for a considerable time, NBC worked with other in the industry, the NANBA Technical Committee and the U.S. government to achieve a single worldwide HDTV production standard, based on the 1125 lines and 60 Hz field rate suggested in Report 801-2, Annex II. In supporting this effort, NBC recognized that this production standard posed significant problems for U.S. domestic use because, as stated above, ACTV-I and all other NTSC-compatible ATV systems would require complex and costly transcoding to transmit to American audiences material produced in this proposed world standard. However, these domestic disadvantages were viewed as a necessary price to pay in order to gain the advantages of a single worldwide exchange standard.

The Europeans were similarly disturbed by domestic compromises they would have to make, particularly with the proposed use of a 60-Hz field rate instead of the European 50-Hz field rate. As a result, the Eureka 95 program has generated a rival production standard more suitable to European needs, using 1250 lines (twice their current 625)

and retaining their present 50-Hz field rate. This Eureka 95 project for a 50-Hz standard is a joint effort of the European Community, supported by the member governments and the major European electronics manufacturers--Thomson, Philips, Bosch, Thorn-EMI. They have invested heavily in this effort and are strongly committed to the adoption of a European 50-Hz standard.

NBC continues to support the ideal of a single world standard for production and program exchange, if it is achievable. However, it has become obvious to us and other observers that the Europeans will not accept the proposed 1125/60 standard. Therefore, we believe we should be devoting our time and efforts toward the consideration of alternative strategies and compromises, rather than remaining frozen in our present position of supporting a particular proposal that is destined to be rejected as a world standard. If we remain fixed on the 1125/60 standard until its final rejection, we risk the loss of the opportunity to achieve other worthy compromises in the effort to achieve a worldwide standard.

Based on the belief that European broadcasters will not accept an 1125/60 standard but will adhere to the Eureka format, with 1250 lines and 50-Hz field rate, NBC reviewed possible options that would address the needs of the U.S. television industry. In October, 1988, NBC

submitted to SMPTE documentation for an optimal, American production standard, describing the basic characteristics of the video signals that would be associated with origination equipment operating in the following HDTV production formats:

1050 scan lines, 59.94 Hz field rate, 2:1 interlace
525 scan lines, 59.94 Hz field rate, 1:1 interlace
1050 scan lines, 59.94 Hz field rate, 1:1 interlace.

The concept underlying this proposal had the support of CATS, CapCities/ABC, Faroudja Laboratories, North American Philips, Sarnoff, Tele-communications, Inc. (TCI), Thomson, Tribune Broadcasting and Zenith. These parameter values were chosen specifically to provide an economic and evolutionary means to implement ATV in the American NTSC environment, consistent with the FCC's preliminary conclusions regarding the importance of NTSC compatibility.

The choice of the optimum high definition television (HDTV) production standard is greatly influenced by the perspective of the user who quite naturally takes account of his application for the technology. This difference in Point of view as to the end use of the HDTV signal may explain the resulting differing opinions held as to the ideal starting format. In the minds of some, HDTV production of movies is a dominant need. For others,

movie production and subsequent distribution to theaters by means of satellite is an overriding goal. Still others believe that HDTV is essential to the viability of direct broadcast by satellite (DBS). To still different interests, the choice of the appropriate HDTV system is dictated by the requisites of cable television. Additional interests will look to the best HDTV standard for video cassette recorder (VCR) and videodisc distribution of programming. And, of course, there are those who see the synergy of HDTV with terrestrial broadcasting as the paramount concern. There are numerous other purposes to which the HDTV production standard will be put to bear.

The proper stratagem for endorsing an HDTV production system might be to take cognizance of the diversity of applications and to attempt to adapt the signal originating in the studio so that it is harmonious with the multiplicity of uses. The conclusion is that an HDTV production standard cannot be chosen in isolation. There are inherent interrelationships with the final destination of the signal that need to be satisfied.

Thus, contrary to the views of some, it is NBC's position that HDTV production and transmission standards are intimately related and should be addressed in that

manner. All television systems consist of three parts: production, transmission and receiver/display. The operations of these aspects should be matched to the greatest extent possible, to insure the highest quality delivery to the viewer at the least expense. For this reason, as the prospect of a single, worldwide HDTV production standard has diminished, NBC has felt it appropriate to focus upon a standard suited to North American and particularly U.S. HDTV broadcast transmission concerns and "friendly" to all media. Nevertheless, we have remained hopeful of achieving maximum HDTV commonality internationally, and, to that end, recently proposed a further compromise.

While we continue to support the establishment of a 1050/59.94 domestic standard, on February 2, 1989, we urged the international broadcasting community to consider a proposed standard that would use a set of common elements, such as line structure or image format, but recognizes the different electronic systems in individual regions and countries. Several participants from Eastern and Western Europe, North America and the Pacific at the IWP 11/6 meetings held in January, 1989, introduced the common image concept, and the European Broadcasting Union actively supported it. The concept implies the coexistence of parameters at 1250 lines/59.94 Hz and 1250 lines/50-Hz.

In fact, this new initiative toward a common image format, which would allow each country to keep its present field frequency while sharing a universal image format, presents a great opportunity for worldwide agreement. It would be unfortunate if this desirable and attainable objective were to be sacrificed by continuing a futile attempt to adopt the 1125/60 system.

Benefits of 59.94 Field Rate

We believe that the 59.94-Hz field rate for HDTV production systems is clearly in the best interest of U.S. and North American broadcasters and that it is less important to cleave to a 1050-line system. We continue to believe that 1050 lines remains ideal for the United States, because in the U.S. it will be easier for any video medium, whether over-the-air broadcasting, fiber, cable, video cassette recorders or DBS, to address existing receivers fed at a 1050-line rate. Nevertheless, it appears that Europe is firmly committed to a 1250-line format, and a common image format with a common line count could reduce the number of conversion parameters and thus improve picture quality at reduced cost. A compromise on the number of lines is feasible in order to achieve such a common line structure for international program exchange, but a field rate of 59.94-Hz is crucial for U.S. production.

The importance of 59.94-Hz timing for the U.S. cannot be over-emphasized. It is essential for the ATV transmission system, in order to maintain compatibility with existing NTSC receivers, and therefore it is important the production standard be based on 59.94-Hz field rate to avoid the complexity, cost and loss of quality caused by transcoding from a different production standard.

Originally, when black-and-white NTSC television was standardized in the early 1940's, it used a 60-Hz field rate. When NTSC color was introduced in the 1950's, it was correctly thought to be important to maintain compatibility with the then-existing black-and-white NTSC receivers. Color information was transmitted by a subcarrier whose frequency was carefully chosen to allow frequency interleaving of color and luminance information. To prevent interference by the color subcarrier to the sound subcarrier, the horizontal scanning frequency was changed. To scan 525 lines in two fields without creating mutual picture and color interference and to maintain compatibility with existing black-and-white sets, a 59.94-Hz field frequency was calculated. Today, nearly all domestic broadcast

production and editing is done with 59.94-Hz timing, and use of any other timing would require frame rate transcoding to maintain NTSC compatibility.

The FCC has tentatively decided that U.S. broadcasters must continue to serve the 160 million existing NTSC receivers. Therefore, the HDTV production standard should conform to the NTSC field rate of 59.94-Hz. It is appropriate to consider the primary use, and users, of HDTV programming in determining a U.S. position on an HDTV production standard. This is domestic program distribution. While there is and will continue to be an important international market for U.S. television programming, this constitutes a secondary revenue stream, and we should carefully consider the relative values of each before ease of domestic distribution is sacrificed for speculative international benefits.

Disadvantages of 1125/60 Production Standard

Following the proposal of 1125/60 to the CCIR as a single worldwide studio standard, a number of countries have expressed concern regarding the necessity of converting from that standard to the standards used for broadcasting nationally. To avoid this problem, Europe will undoubtedly adopt a system based on the European

50-Hz field rate. Similarly, in the United States there is growing concern about transcoding from 60 Hz to the U.S. standard 59.94-Hz.

Contrary to the assertions of some, the transcoding problem that would occur if a 59.94-Hz field rate becomes the U.S. transmission standard and 1125/60 the production standard would be neither simple nor inexpensive to solve. The 60 Hz production signal would have to be transcoded prior to transmission. Because frames would arrive faster than they are released, a source frame from a live program would have to be dropped in about every 33 seconds, in an unbuffered system, causing discontinuity in the flow of motion. Moreover, accumulating temporal error may cause problems in video/audio synchronization, unless the audio is duration-modified on a continuous basis, which in itself would require expensive specialized audio equipment. These are unnecessary problems that would be imposed on U.S. broadcasters if the production standard is not based on the 59.94-Hz field rate of the transmission standard.

All of these reasons render 1125/60 unsuitable for the U.S. government to support as a production standard, now that it has become clear that it is unlikely to become the single worldwide exchange standard.

We believe, however, that it continues to be important for the U.S. government to take a position on this issue at the CCIR. Not only would an international production standard that is "friendly" to the U.S. standard facilitate our role as an important supplier of programming internationally, this could provide a much-needed boost to the U.S. manufacturing sector, as well. Ideally, a U.S. production standard should not be finally selected until our transmission standard has been determined, as, in our view, they are intimately related. Domestically, at least, it makes little sense for studio HDTV productions to require expensive and complicated transcoding prior to transmission; indeed, regardless of whether or what international production standard ultimately may be established, it is most likely that the U.S. will use a standard that optimizes the relationship between its production and transmission activities.

Even though the U.S. has not determined its transmission standard, some general conclusions about its likely characteristics can be made with a high degree of confidence. These assumptions permit an extrapolation to some characteristics of an appropriate production standard. As we have stated, the FCC preliminary requirement of NTSC compatibility is likely to result in a 59.94-Hz field rate for the transmission system.

This motivated NBC's initial standards proposal. The three closely-related "1050/59.94" standards that NBC has proposed for domestic use allow for easy transcoding among themselves. Even domestically, adoption of a "family" of standards will allow further evolutionary development of future ATV systems. The horizontal and vertical timings are identical for 1050 line 2:1 interlace and 525 line progressive scan formats; therefore, it is possible that production equipment that can flexibly accommodate either format at the discretion of the operator could be developed economically.

We extended the "family" of standards in developing our recent international proposal. Because, in our view, selection of the number of lines, and interlaced versus progressive scan, will be less important domestically in the choice of a production standard than system timing considerations, we also have proposed parameters at 1250 lines/59.94 Hz and 1250 lines/50 Hz. In our view, each country needs to optimize its HDTV production standard for its primary domestic market, but should also be permitted to engage in minimal standards conversion for the secondary, international market. We believe that this principle should inform the U.S. governmental position on international HDTV production standards. The decision-making process need not result in a single

standard, but in a family of related standards, each requiring a minimum of standards conversion to the other. While a single world standard would be ideal, a unified set of exchange standards has a more realistic chance of support by all regions.

Conversion problems would be minimized by a unified set or family of standards that has a maximum of commonality among its members. Such a set of standards would have the added benefit of facilitating an evolutionary, measured approach to the introduction of HDTV, avoiding the necessity of sudden departures from the existing system, which would both require enormous investment and inevitably result in dislocations in the marketplace.

For example, a standard set based on the concept of a "common image format" would provide a common aspect ratio of 16:9, field/frame rates appropriate to current individual national broadcasting standards and a common tristimulus color system (R, G, B or luminance and color difference signals). The conversion process is reduced to a single dimension, because the horizontal and vertical dimensions are the same for all systems (1920 pels H and 1160 lines V) and only the temporal dimension changes to

accommodate the different frame rates. Such systems would have the same number of active lines per field/frame and the same number of picture elements per active line.

This structural commonality offers the advantage of requiring for translation, neither horizontal nor vertical interpolation. Additionally, equipment that is structurally dependent, such as CCD cameras and frame stores, can have the same organization regardless of the frame rate of the final application. This should reduce the cost of the solid-state cameras and displays, that are likely to be in widespread use in the future.

Conclusion

NBC believes that the United States government should continue to represent the interests of all members of the United States communications industry, as well as the American public; in international forums, including standards-setting bodies, such as the CCIR. Particularly now, when a variety of approaches to the production standard question are being examined, the opportunity to champion an approach that is best suited to the United States should not be forsaken. As we have stated, we believe the production standard question is important in

part because production and transmission standards are in fact related: the "friendlier" the production standard, to the transmission standard, the less standards conversion will be required. Therefore, the process will be less expensive for all concerned, programmers, broadcasters, equipment manufacturers and, of course, the public. This could facilitate the earlier introduction of ATV in this country.

While a single worldwide standard would be ideal from the point of view of international program exchange, it also is important for each country and region to optimize its own ATV system. Indeed, this may be what is going on within the CCIR today. The Europeans believe they have an optimal system for their purposes, as do the Japanese. Taking a position on one or another side of this controversy, as the U.S. has heretofore, has merely contributed to the Balkanization of HDTV, a medium that has unprecedented potential to bring the world together.

When frontal assault clearly will not succeed, the alternative approach of compromise should be considered. If the world cannot be brought together to a single standard, the United States should consider supporting a related "family" of standards, such as those derived under

the "common image format" approach discussed herein. This compromise would permit each country or region to optimize, or match, its own HDTV production and transmission standards, as well as minimizing the cost to each of standards conversion for international program exchange.

For all the reasons discussed above, NBC believes that the "common image format" approach to a family of international HDTV exchange standards is in the public interest and thus should be endorsed by the United States.

Respectfully submitted,

Molly Pauker

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March 1, 1989